

iOS 7 Tech Talks 2013



San Francisco



New York



Tokyo



Shanghai



Berlin



London

These are confidential sessions—please refrain from streaming, blogging, or taking pictures

Architecting Modern iOS Games

Dave DeLong
App Frameworks Evangelist

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Overview



Building for *A7*

APL0598339S0



GKBC40H11213

K3PE7E700FXG

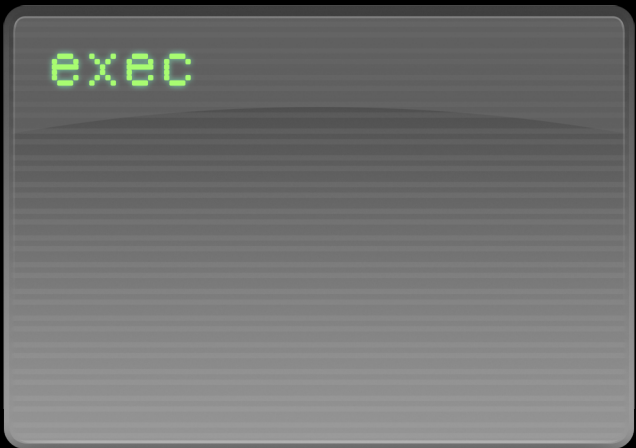
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64-bit

64-bit Benefits

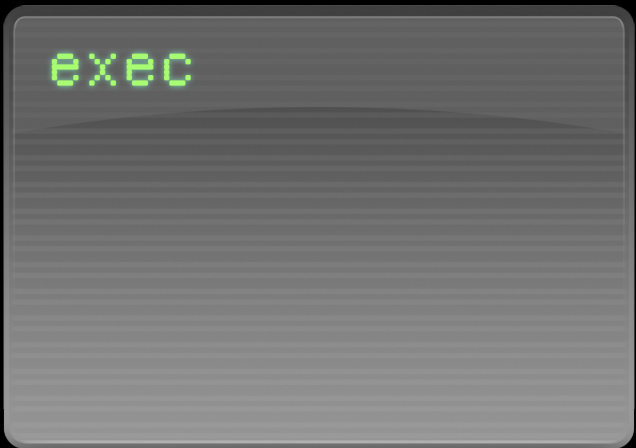
- 2x integer registers
- 2x floating point registers
- More efficient assembly code
- Objective-C Runtime optimizations
- Faster performance
- Universal code base
- Build for the future

Your App Bundle



Your App Bundle

•Including 64-bit



ApplicationGroup	Mine
CFBundleDevelopmentRegion	English
CFBundleExecutable	MyApp
CFBundleIconFile	MyAppIcon.icns
CFBundleIdentifier	com.me.myApp
CFBundleName	My Application
CFBundleGetInfoString	Copyright 2009, Me
CFBundleShortVersionString	1.0
CFBundleVersion	1.0
NSMainNibFile	MainMenu
NSPrincipalClass	MyClass

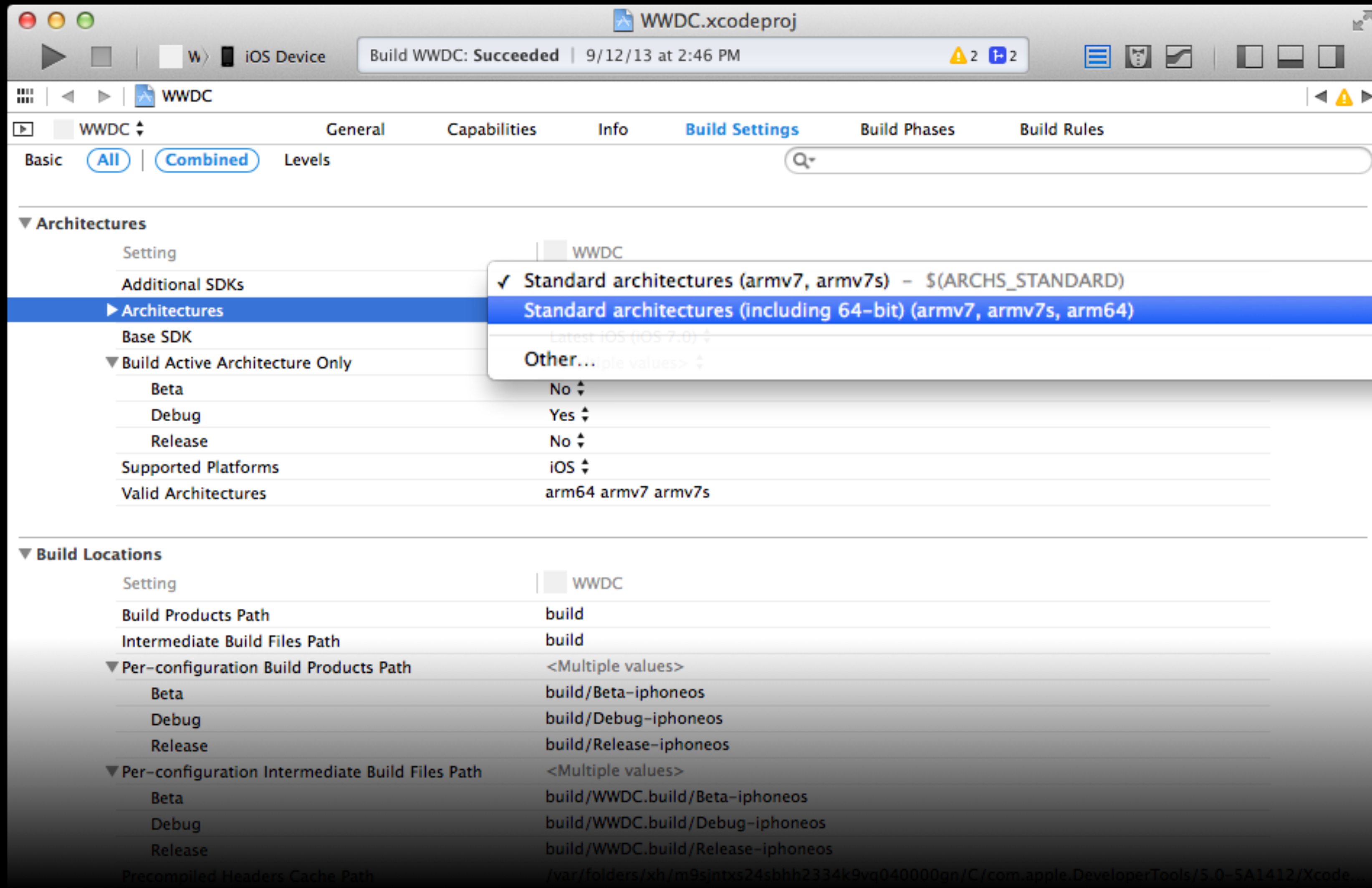




Adopting 64-bit



Update Architectures



Adopting 64-bit



Update Libraries

- All code must be 64-bit
- Can't use 32-bit library in a 64-bit app



Updating Libraries

```
$file libSomeLibrary.a
```

```
libSomeLibrary.a: Mach-O universal binary with 5 architectures
```

```
libSomeLibrary.a (for architecture armv7): current ar archive random library
```

```
libSomeLibrary.a (for architecture armv7s): current ar archive random library
```

```
libSomeLibrary.a (for architecture arm64): current ar archive random library
```

```
libSomeLibrary.a (for architecture i386): current ar archive random library
```

```
libSomeLibrary.a (for architecture x86_64): current ar archive random library
```


Adopting 64-bit



Primitives

	32-bit Size (ILP32)	64-bit Size (LP64)
char	1 byte	1 byte
BOOL	1 byte	1 byte
short	2 bytes	2 bytes
int	4 bytes	4 bytes
long	4 bytes	<i>8 bytes</i>
long long	8 bytes	8 bytes
pointer	4 bytes	<i>8 bytes</i>
size_t	4 bytes	<i>8 bytes</i>
NSInteger	4 bytes	<i>8 bytes</i>
CGFloat	4 bytes	<i>8 bytes</i>
CFIndex	4 bytes	<i>8 bytes</i>

Precision

- NSInteger
 - 32-bit: -2,147,483,648 to 2,147,483,647
 - 64-bit: -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
- CGFloat
 - 32-bit: -3.4e38 to 3.4e38
 - 64-bit: -1.79e308 to 1.79e308

64-bit In Code

Mismatched Types



```
int myInt = [myNumber integerValue];
```



64-bit In Code

Mismatched Types



```
NSInteger myInteger = [myNumber integerValue];
```


64-bit In Code

Mismatched Sizes



```
long myLong = 5000000000;  
memcpy(buffer, &myLong, 4);  
  
// buffer contains 4294967296
```

64-bit In Code

Mismatched Sizes



```
long myLong = 5000000000;  
memcpy(buffer, &myLong, sizeof(long));  
  
// buffer contains 5000000000
```

64-bit In Code

Mismatched Formats



```
long myLong = 5000000000;  
NSString *s = [NSString stringWithFormat:@"%d", myLong];  
  
// s = @"705032704"
```


64-bit In Code

Mismatched Formats



```
long myLong = 5000000000;  
NSString *s = [NSString stringWithFormat:@"%ld", myLong];  
  
// s = @"5000000000"
```

Be consistent.

Use proper types, sizes, and format strings.

64-bit On Disk

- Sharing data between devices
 - Restoring from backup



Read what you write.

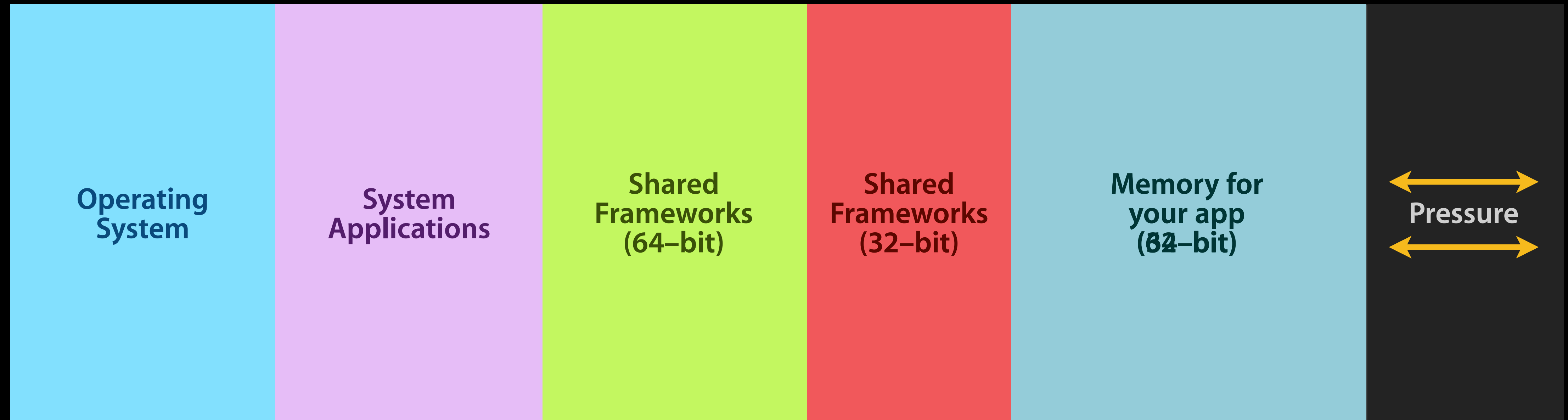
Write 32 bits, read 32 bits.
Write 64 bits, read 64 bits.

64-bit On Disk

- Sharing data between devices
 - Restoring from backup
- Read what you write
 - Write 32 bits, read 32 bits
 - Write 64 bits, read 64 bits
- Consider including metadata

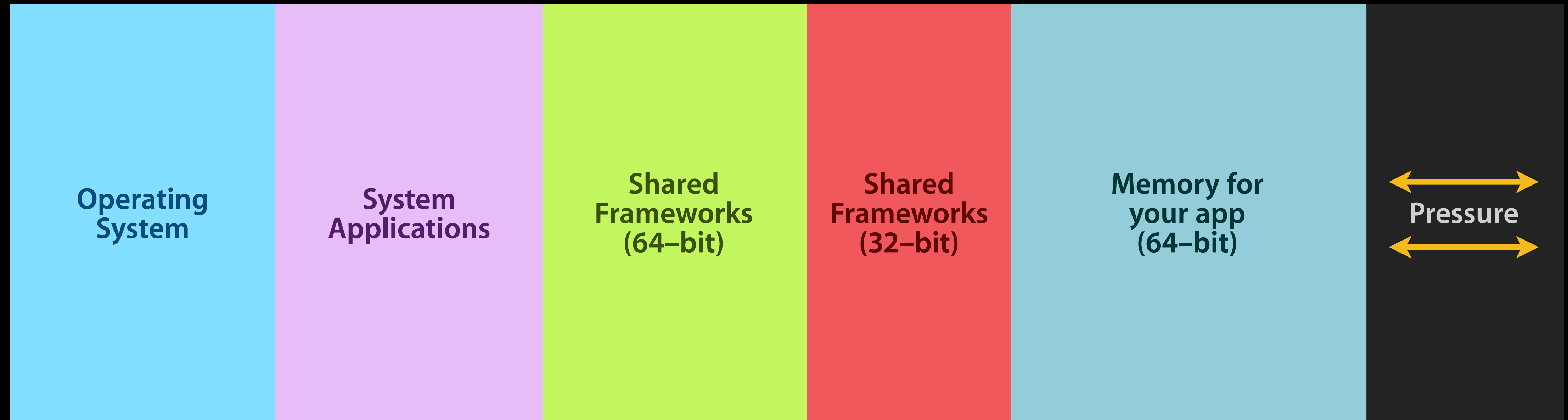
64-bit In Memory

- Memory usage increases
 - pointers, longs, CGFloats, ...
- 32-bit only is not better



64-bit In Memory

- Memory usage increases
 - pointers, longs, CGFloats, ...
- 32-bit only is not better

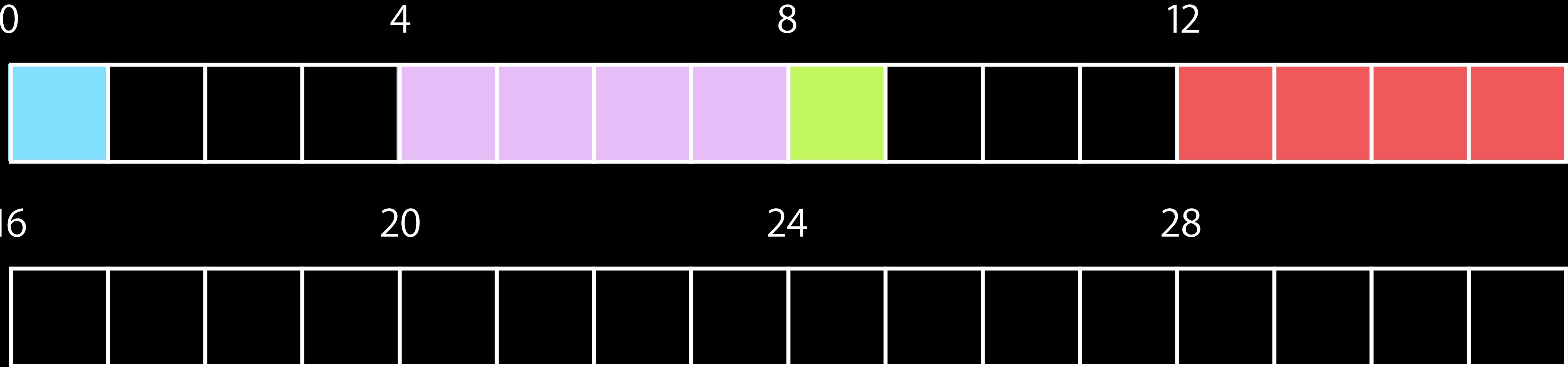


Alignment

	32-bit Alignment	64-bit Alignment
char	1 byte	1 byte
BOOL	1 byte	1 byte
short	2 bytes	2 bytes
int	4 bytes	4 bytes
long	4 bytes	<i>8 bytes</i>
long long	4 bytes	<i>8 bytes</i>
pointer	4 bytes	<i>8 bytes</i>
size_t	4 bytes	<i>8 bytes</i>
NSInteger	4 bytes	<i>8 bytes</i>
CGFloat	4 bytes	<i>8 bytes</i>
CFIndex	4 bytes	<i>8 bytes</i>

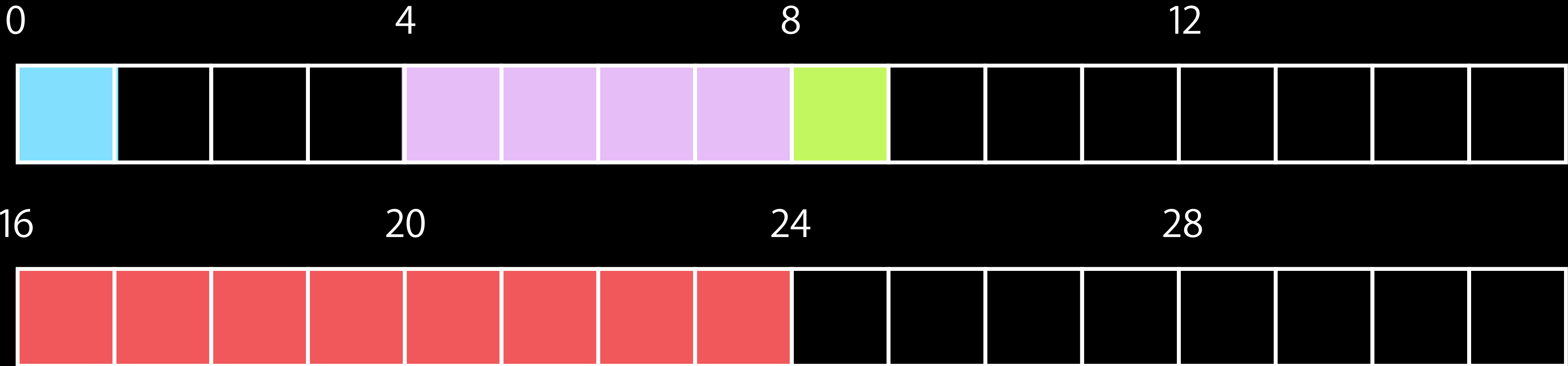
32-bit Alignment

```
struct MyStruct {  
    char a;  
    int b;  
    char c;  
    void *d;  
};
```



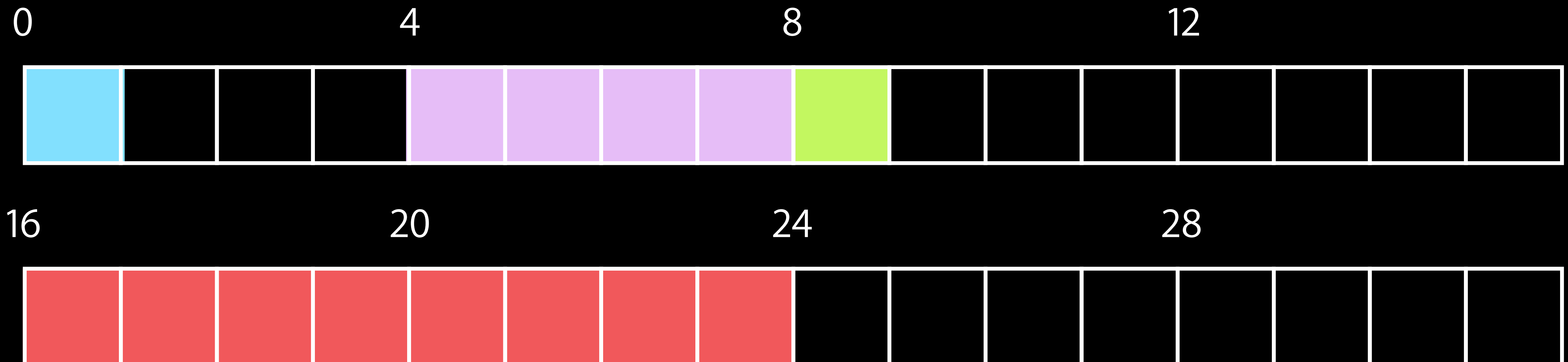
64-bit Alignment

```
struct MyStruct {  
    char a;  
    int b;  
    char c;  
    void *d;  
};
```



Packing

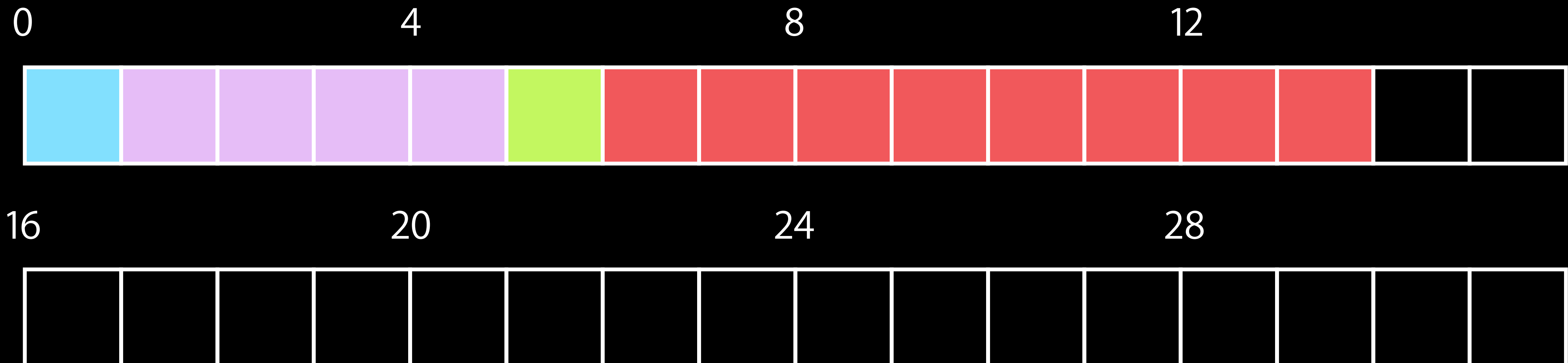
```
#pragma pack(push, 1)
struct MyStruct {
    char a;
    int b;
    char c;
    void *d;
};
#pragma pack(pop)
```



Packing



```
#pragma pack(push, 1)
struct MyStruct {
    char a;
    int b;
    char c;
    void *d;
};
#pragma pack(pop)
```



Rearranging



```
struct MyStruct {
```

```
    void *d;
```

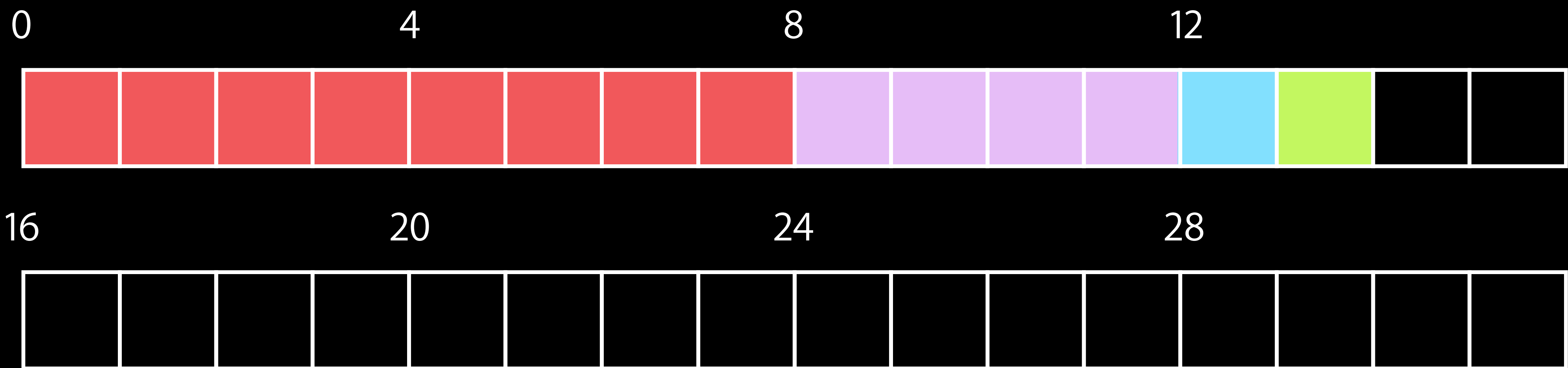
```
    int b;
```

```
    char c;
```

```
    char a;
```

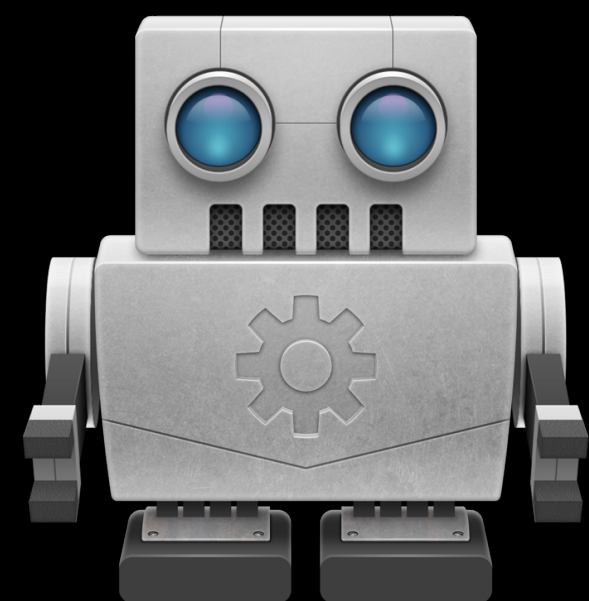
```
};
```

Largest to smallest



Adopting 64-bit





+



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64-bit Wrap-up

- “64-bit Transition Guide for Cocoa Touch”
- Convert to 64-bit

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Building for iOS 7

“How do I use iOS 7 features but still support iOS 6?”

Use the iOS 7 Base SDK

Check to see if the feature exists

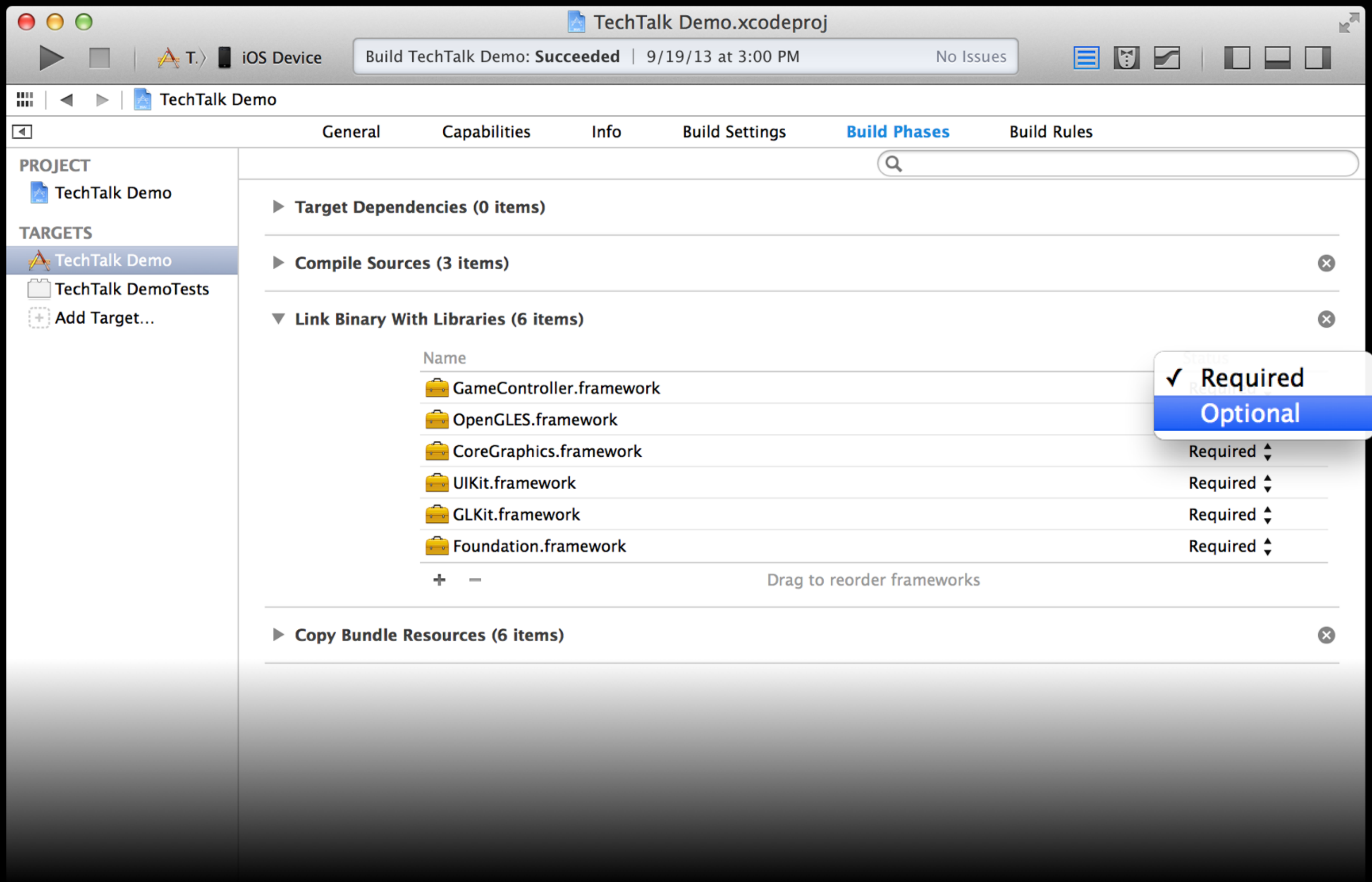
Adopting New...

- Frameworks and classes
- Methods
- Capabilities
- Designs
- Architectures

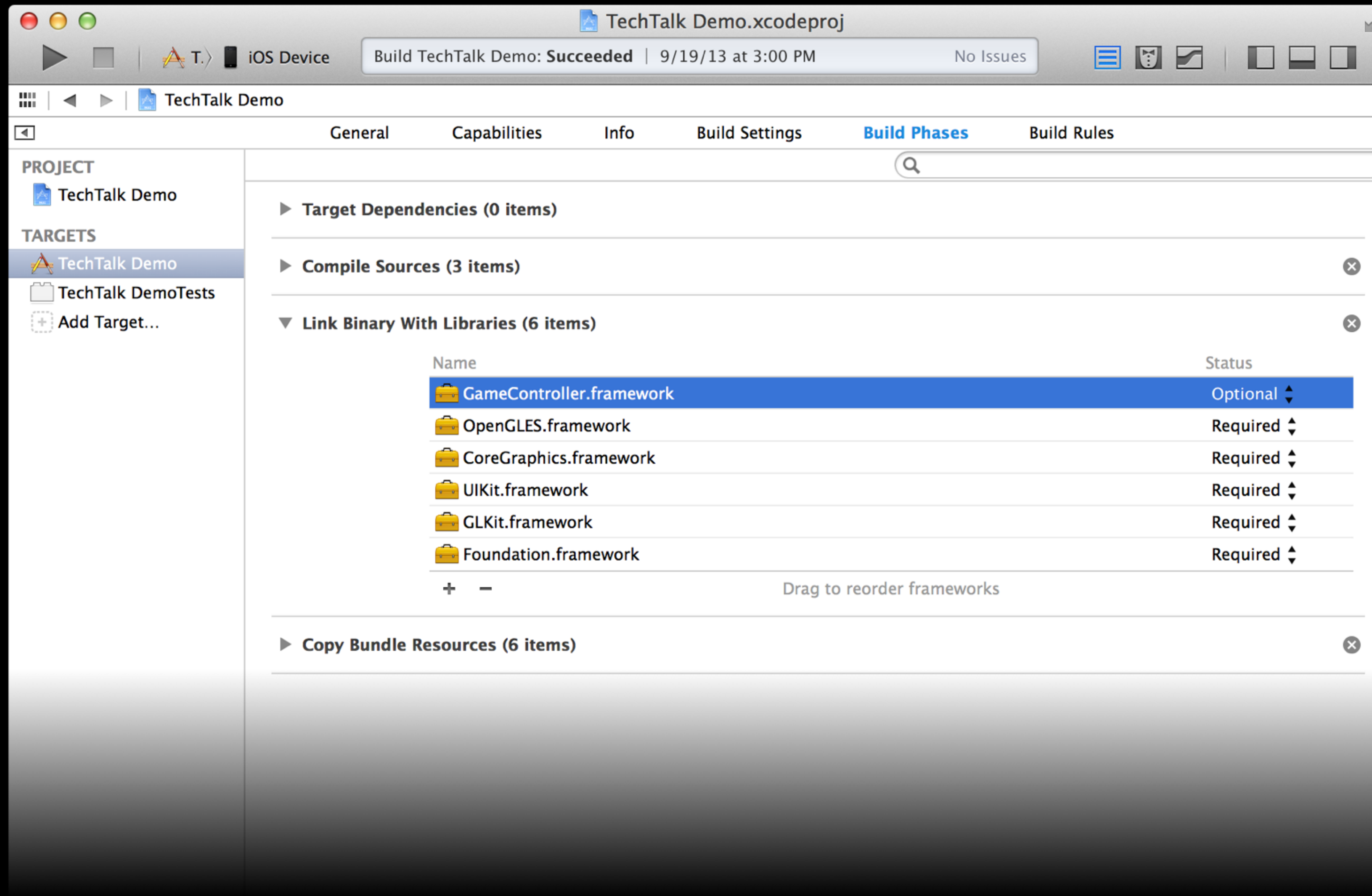
Adopting New...

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Optional Frameworks



Optional Frameworks



Optional Frameworks

- Manual compilation with Clang
- Required framework
 - `-framework GameController`
- Optional framework
 - `-weak_framework GameController`



```
[GCController startWirelessControllerDiscoveryWithCompletionHandler:^(  
    // Discovery timed out or was stopped  
})];
```



```
[nil      startWirelessControllerDiscoveryWithCompletionHandler:^(  
    // Discovery timed out or was stopped  
});
```




```
[GCController startWirelessControllerDiscoveryWithCompletionHandler:^(  
    // Discovery timed out or was stopped  
})];
```



```
NSNotificationCenter *center = [NSNotificationCenter defaultCenter];  
[center addObserver:self  
    selector:@selector(foundController:)  
    name:GCCControllerDidConnectNotification  
    object:nil];
```



```
NSNotificationCenter *center = [NSNotificationCenter defaultCenter];  
[center addObserver:self  
    selector:@selector(foundController:)  
    name:nil  
    object:nil];
```



```
if (&GCCControllerDidConnectNotification != nil) {  
    NotificationCenter *center = [NotificationCenter defaultCenter];  
    [center addObserver:self  
        selector:@selector(foundController:)  
        name:GCCControllerDidConnectNotification  
        object:nil];  
}
```

Adopting New...

- Frameworks and classes
- Methods
- Capabilities
- Designs
- Architectures



```
UIMotionEffect *effect = [self makeNewParallaxMotionEffect];  
[self.view addMotionEffect:effect];
```



```
UIMotionEffect *effect = [self makeNewParallaxMotionEffect];  
[self.view addMotionEffect:effect];
```




```
SEL selector = @selector(addMotionEffect:);  
if ([self.view respondsToSelector:selector]) {  
    UIMotionEffect *effect = [self makeNewParallaxMotionEffect];  
    [self.view addMotionEffect:effect];  
}
```

Adopting New...

- Frameworks and classes
- Methods
- Capabilities
- Designs
- Architectures

Adopting New Capabilities

`+ [CMMotionActivityManager isActivityAvailable]`

`+ [MFMailComposeViewController canSendMail]`

`+ [CLLocationManager isMonitoringAvailableForClass:]`

`+ [UIPrintInteractionController isPrintingAvailable]`

`– [NSFileManager URLForUbiquityContainerIdentifier:]`

`...`

Adopting New Capabilities

```
if ([CMMotionActivityManager isActivityAvailable]) {  
  
    CMMotionActivityManager *m = [CMMotionActivityManager new];  
    [m startActivityUpdatesToQueue:[NSOperationQueue mainQueue]  
        withHandler:^(CMMotionActivity *) {  
  
        // some motion occurred  
  
    }];  
}
```

Adopting New...

- Frameworks and classes
- Methods
- Capabilities
- Designs
- Architectures

Adopting New Designs

- Version check
- `NSFoundationVersionNumber`
 - `NSFoundationVersionNumber_iOS_6_1`
 - `NSFoundationVersionNumber_iOS_6_0`
 - ...
- `<Foundation/NSObjCRuntime.h>`

Checking for Versions

```
float versionNumber = floor(NSFoundationVersionNumber);  
if (versionNumber <= NSFoundationVersionNumber_iOS_6_1) {  
    // use iOS 6-style appearance  
} else {  
    // use iOS 7-style appearance  
}
```


Adopting New...

- Frameworks and classes
- Methods
- Capabilities
- Designs
- Architectures

Adopting New Architectures

- Different code on different *CPUs*
- Affects compilation
- Rare to use

```
#if __LP64__  
// code that will only execute on a 64-bit device  
#else  
// code that will only execute on a 32-bit device  
#endif
```

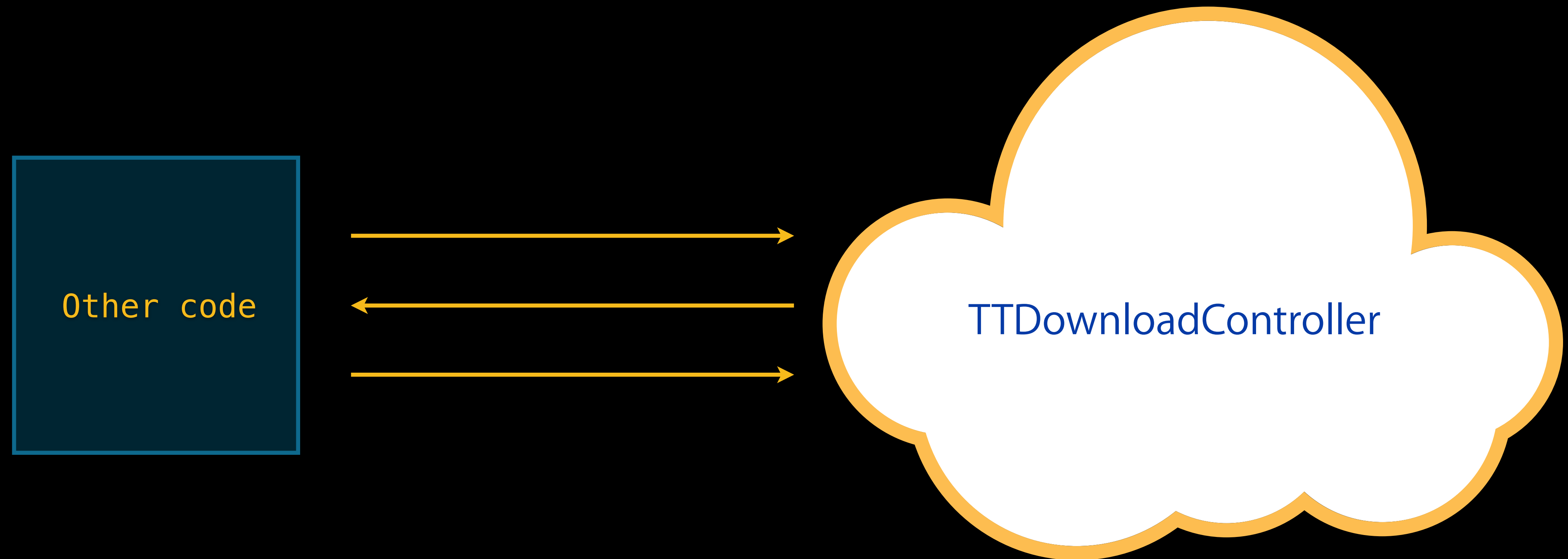
Hiding Feature Checks

- Don't put if-checks everywhere
- Leads to messy and unmaintainable code
- Encapsulate in wrappers
- Patterns
 - Clusters
 - Data Sources
 - Categories

Class Clusters

- Single @interface, multiple @implementations
- Common in Cocoa: NSArray, UIButton, ...
- Private subclasses
- Encapsulate features tied to classes
- Extremely easy to remove obsolete code

Class Clusters



```
@interface TTDownloadController : NSObject

+ (instancetype)downloadController;

- (void)startDownload:(TTDownload *)download;
- (void)pauseDownload:(TTDownload *)download;

...

@end
```

```
@interface TTDownloadController_NSURLSession : TTDownloadController @end
@interface TTDownloadController_NSURLConnection : TTDownloadController @end
```

```
@implementation TTDownloadController
```

```
+ (instancetype)downloadController {
```

```
    if ([NSURLSession class] != nil) {
```

```
        return [[TTDownloadController_NSURLSession alloc] init];
```

```
    } else {
```

```
        return [[TTDownloadController_NSURLConnection alloc] init];
```

```
    }
```

```
}
```

```
...
```

```
@end
```



```
@interface TTDownloadController_NSURLSession : TTDownloadController @end
```

```
@implementation TTDownloadController
```

```
+ (instancetype)downloadController {
```

```
    return [[TTDownloadController_NSURLSession alloc] init];
```

```
}
```

```
...
```

```
@end
```

Data Sources

- Composition vs subclassing
- Data source encapsulates logic
- Encapsulate features tied to classes

```
@interface TTDownloadController : NSObject

+ (instancetype)downloadController;

- (void)startDownload:(TTDownload *)download;
- (void)pauseDownload:(TTDownload *)download;

...

@end
```

```
@interface TTDownloadController ()
```

```
@property (strong) id<TTDownloader> downloader;
```

```
@end
```

```
@implementation TTDownloadController
```

```
+ (instancetype)downloadController {
```

```
    id<TTDownloader> downloader = nil;
```

```
    if ([NSURLSession class] != nil) {
```

```
        downloader = [[TTURLSessionDownloader alloc] init];
```

```
    } else {
```

```
        downloader = [[TTURLConnectionDownloader alloc] init];
```

```
    }
```

```
    return [[self alloc] initWithDownloader:downloader];
```

```
}
```

```
...
```

```
@end
```

```
@interface TTDownloadController ()
@property (strong) id<TTDownloader> downloader;
@end

@implementation TTDownloadController

+ (instancetype)downloadController {
    id<TTDownloader> downloader = nil;

    downloader = [[TTURLSessionDownloader alloc] init];

    return [[self alloc] initWithDownloader:downloader];
}

...
@end
```

Categories

- Add methods to framework classes
- Encapsulate features tied to methods



```
UIMotionEffect *parallaxEffect = [self makeNewParallaxMotionEffect];  
  
[self.view addMotionEffect:parallaxEffect];
```



```
@interface UIView (TechTalkCompatibility)

- (void)tt_addMotionEffect:(UIMotionEffect *)effect;

@end
```

```
@implementation UIView (TechTalkCompatibility)
```

```
- (void)tt_addMotionEffect:(UIMotionEffect *)effect {  
    if ([self respondsToSelector:@selector(addMotionEffect:)]) {  
        [self addMotionEffect:effect];  
    }  
}
```

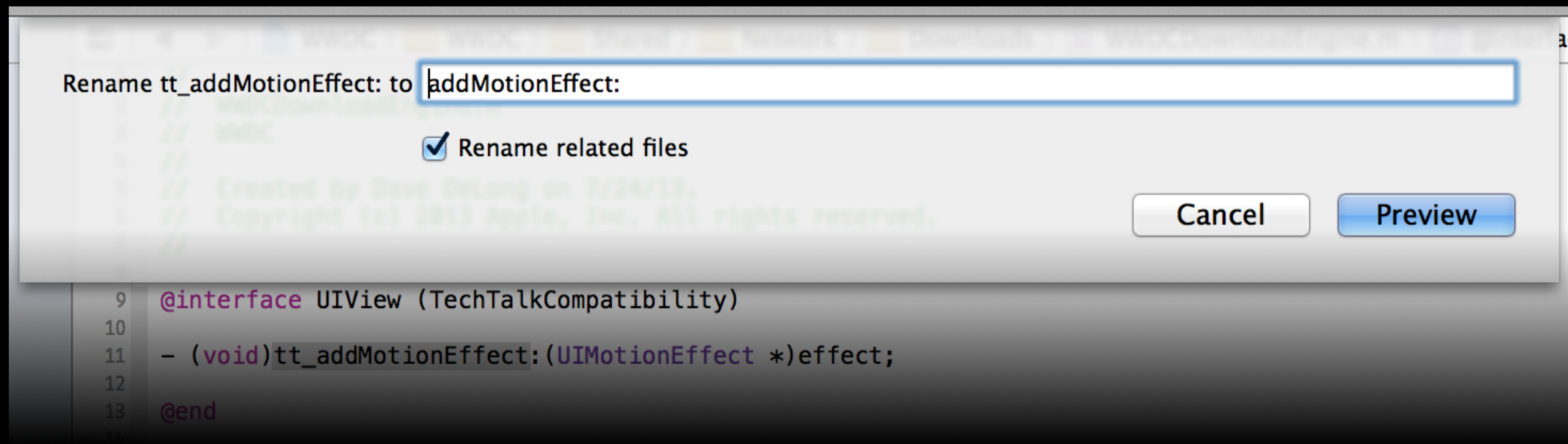
```
@end
```

```
UIMotionEffect *parallaxEffect = [self makeNewParallaxMotionEffect];
```

```
[self.view tt_addMotionEffect:parallaxEffect];
```

Categories

- Add methods to framework classes
- Hide features tied to methods
- Remove via Edit ► Refactor ► Rename...



Backporting Features

- Some features can be approximated
- Some are very hard to duplicate
- Scale back experience on older OSes



